CLAIMS

1. An oligonucleotide comprising:

5'TCGX$_1$X$_2$N$_1$3'

wherein X$_1$ is any nucleotide, X$_2$ is A, T, or C when X$_1$ is C or A, X$_2$ is A or G when X$_1$ is T, X$_2$ is any nucleotide when X$_1$ is G, N$_1$ is 2-95 nucleotides, wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, and wherein N$_1$ does not include an unmethylated CG motif.

2. An oligonucleotide comprising:

5'TCGTN$_1$3'

wherein N$_1$ is 3-96 nucleotides, wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein N$_1$ does not include an unmethylated CG motif and when N$_1$ is 16 nucleotides N$_1$ does not include a C$_{12}$ and when N$_1$ is 8 nucleotides N$_1$ is at least 50% C or 70% T.

3. An oligonucleotide comprising:

5'TCGAN$_1$3'

wherein N$_1$ is 3-96 nucleotides, wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein N$_1$ does not include an unmethylated CG motif and when N$_1$ is 19 nucleotides N$_1$ is at least 55% pyrimidine, and when N$_1$ is 8 nucleotides N$_1$ is at least 50% T or C.

4. An oligonucleotide comprising:

5'TCGN$_1$3'

wherein N$_1$ is 10-96 nucleotides, wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein the C content of the oligonucleotide is less than or equal to 60%, and the A content is less than or equal to 30%, and wherein N$_1$ does not include an unmethylated CG motif.

5. An oligonucleotide comprising:

5'TYZN$_1$3'

wherein Y is a cytosine or modified cystosine, wherein Z is a guanine or modified guanine, N_1 is 4-97 nucleotides, wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, and wherein the oligonucleotide does not include an unmethylated CG motif.

6. The oligonucleotide of any one of claims 1-5, wherein the oligonucleotide includes at least 1 modified internucleotide linkage.

7. The oligonucleotide of any one of claims 1-5, wherein the oligonucleotide includes at least 50% modified internucleotide linkage.

8. The oligonucleotide of any one of claims 1-5, wherein all internucleotide linkages of the oligonucleotide are modified.

9. The oligonucleotide of any one of claims 1-5, wherein the oligonucleotide is 20-100 nucleotides in length.

10. The oligonucleotide of claim 6, wherein the stabilized internucleotide linkage is a phosphorothioate linkage.

11. The oligonucleotide of any one of claims 3 or 4, wherein the oligonucleotide has the following structure: 5' T*C*G*A*G*G*A*C*T*T*C*T*C*T*C*A*G*G*T*T 3' (SEQ. ID NO.: 50) and wherein * refers to a phosphorothioate linkage.

12. The oligonucleotide of any one of claims 2 or 4, wherein the oligonucleotide has the following structure: 5' T*C*G*T*T*T*T*T*T*T*T*T*T*T*T*T*T*T 3' (SEQ. ID NO.: 2) and wherein * refers to a phosphorothioate linkage.

13. The oligonucleotide of any one of claims 1-5, wherein N_1 is N_2N_3 and wherein N_2 is 8-94 nucleotides and N_3 is 2-5 pyrimidines.

14. The oligonucleotide of claim 13, wherein N_3 is TTTTT.

15. The oligonucleotide of claim 13, wherein N_3 is TT.

16. The oligonucleotide of claim 13, wherein N_2 is 8-40 nucleotides.

17. The oligonucleotide of any one of claims 1-5, wherein N_1 is at least 50% pyrimidine.

18. The oligonucleotide of any one of claims 1-5, wherein N_1 is at least 80% pyrimidine.

19. The oligonucleotide of any one of claims 1-5, wherein N_1 is free of Poly-A and Poly-G sequences.

20. The oligonucleotide of any one of claims 1-5, wherein N_1 is TN_2 and wherein N_2 is 8-94 nucleotides.

21. The oligonucleotide of any one of claims 1-5, wherein Y is selected from the group of modified cystosine bases consisting of 5-methyl cytosine, , 5-methyl-isocytosine, 5-hydroxy-cytosine, 5-halogeno cytosine, uracil, N4-ethyl-cytosine, , 5-fluoro-uracil, and hydrogen.

22. The oligonucleotide of any one of claims 1-5, wherein Z is selected from the group of modified guanine bases consisting of 7-deazaguanine, 7-deaza-7-substituted guanine (such as 7-deaza-7-(C2-C6)alkynylguanine), 7-deaza-8-substituted guanine, hypoxanthine, 2,6-diaminopurine, 2-aminopurine, purine, 8-substituted guanine such as 8-hydroxyguanine, and 6-thioguanine, , 2-aminopurine, , and hydogen

23. The oligonucleotide of any one of claims 1-5, wherein the oligonucleotide has a 3'-3' linkage with one or two accessible 5' ends.

24. The oligonucleotide of claim 23, wherein the oligonucleotide has two accessible 5' ends, each of which are 5'TCG.

25. A method for treating allergy or asthma, comprising:

administering to a subject having or at risk of having allergy or asthma an oligonucleotide of any one of claims 1-5 in an effective amount to treat allergy or asthma.

26. The method of claim 25, wherein the oligonucleotide is administered to a respiratory tissue.

27. The method of claim 25, wherein the subject has or is at risk of developing allergic asthma.

28. A method for inducing cytokine production, comprising:

administering to a subject an oligonucleotide of any one of claims 1-5 in an effective amount to induce a cytokine selected from the group consisting of IP10, IL6, IL12, IL18, TNF, chemokines, IFN-α and IFN-γ.

29. A method for treating infectious disease, comprising:

administering to a subject having or at risk of having an infectious disease an oligonucleotide of any one of claims 1-5 in an effective amount to treat the infectious disease.

30. The method of claim 29 wherein the subject has or is at risk of having a bacterial infection.

31. The method of claim 29 wherein the subject has or is at risk of having a viral infection.

32. A method for treating cancer, comprising:

administering to a subject having or at risk of having cancer an oligonucleotide of any one of claims 1-5 in an effective amount to treat cancer.

33. The method of claim 32, wherein the cancer is selected from the group consisting of biliary tract cancer, breast cancer, cervical cancer, choriocarcinoma, colon cancer, endometrial cancer, gastric cancer, intraepithelial neoplasms, lymphomas, liver cancer, lung cancer (e.g. small cell and non-small cell), melanoma, neuroblastomas, ovarian cancer, pancreatic cancer, prostate cancer, rectal cancer, sarcomas, thyroid cancer, renal cancer, bone cancer, brain and CNS cancer, connective tissue cancer, esophageal cancer, eye cancer, Hodgkin's lymphoma, larynx cancer, oral cavity cancer, skin cancer, and testicular cancer, as well as other carcinomas and sarcomas.

34. The method of claim 32, further comprising administering an anti-cancer agent.

35. A method for inducing innate immunity in a subject, comprising:

administering to a subject an oligonucleotide of any one of claims 1-5 in an effective amount to induce innate immunity.

36. A method for inducing a Th1 immune response, comprising:

administering to a subject an oligonucleotide of any one of claims 1-5 in an effective amount to induce a Th1 immune response.

37. A method of modulating an immune response in a subject, comprising administering to the subject an effective amount for modulating an immune response of an oligonucleotide comprising:

5'-X_1YRM_1-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide,

wherein X_1 is a nucleotide,

wherein Y is a cytosine or a modified cytosine,

wherein R is a guanine or a modified guanine,

and wherein M_1 is a nucleic acid of 1-3 nucleotides.

38. The method of claim 37, wherein the internucleotide linkages of the oligonucleotide are stabilized phosphorothioate internucleotide linkages.

39. The method of claim 38, wherein the internucleotide linkage between Y and R is a phosphodiester linkage in an Rp configuration.

40. The method of claim 37, wherein the modified cytosine has a C5 substitution.

41. The method of claim 37, wherein the modified guanine has a C8 or C7 substitution.

42. The method of claim 37, wherein the modified or modified cytosine or guanine is selected from the group consisting of 5-substituted cytosines (e.g. 5-methyl-cytosine, 5-fluoro-cytosine, 5-chloro-cytosine, 5-bromo-cytosine, 5-iodo-cytosine, 5-hydroxy-cytosine, 5-hydroxymethyl-cytosine, 5-difluoromethyl-cytosine, and unsubstituted or substituted 5-alkynyl-cytosine), 6-substituted cytosines, N4-substituted cytosines (e.g. N4-ethyl-cytosine), 5-aza-cytosine, 2-mercapto-cytosine, isocytosine, pseudo-isocytosine, cytosine analogs with condensed ring systems (e.g. N,N'-propylene cytosine or phenoxazine), and uracil and its derivatives (e.g. 5-fluoro-uracil, 5-bromo-uracil, 5-bromovinyl-uracil, 4-thio-uracil, 5-hydroxy-uracil, 5-propynyl-uracil), thymine derivatives (e.g. 2-thiothymine, 4-thiothymine, 6-substituted thymines), 7-deazaguanine, 7-deaza-7-substituted guanine (such as 7-deaza-7-(C2-C6)alkynylguanine), 7-deaza-8-substituted guanine, 7-deaza-8-aza guanine, hypoxanthine, N2-substituted guanines (e.g. N2-methyl-guanine), 5-amino-3-methyl-3H,6H-thiazolo[4,5-d]pyrimidine-2,7-dione, 2,6-diaminopurine, 2-aminopurine, purine, indole, adenine, substituted adenines (e.g. N6-methyl-adenine, 8-oxo-adenine) 8-substituted guanine (e.g. 8-hydroxyguanine and 8-bromoguanine), and 6-thioguanine. In another embodiment of the invention, the base is substituted by a universal base (e.g. 4-methyl-indole, 5-nitro-indole, 3-nitropyrrole, P-base, and K-base), an aromatic ring system (e.g.

benzimidazole or dichloro- benzimidazole, 1-methyl-1H-[1,2,4]triazole-3-carboxylic acid amide) an aromatic ring system (e.g. fluorobenzene or difluorobenzene) and a hydrogen atom (dSpacer).

43. The method of claim 37 wherein the oligonucleotide is associated with a carrier linked to the 3' end of the oligonucleotide.

44. The method of claim 43, wherein the carrier is selected from the group consisting of a microparticle, dendrimer, cholesterol, liposome, cationic complex, and antigen.

45. The method of claim 37, further comprising administering an antigen to the subject.

46. The method of claim 37, further comprising administering a therapeutic protocol to the subject.

47. The method of claim 46, wherein the therapeutic protocol is surgery.

48. The method of claim 37 wherein the oligonucleotide is not associated with a carrier.

49. The method of claim 37 wherein the oligonucleotide is in a multimerized complex.

50. The method of claim 49, wherein the multimerized complex includes the oligonucleotide linked by a multimerization unit to a second oligonucleotide.

51. The method of claim 49, wherein the second oligonucleotide has the formula 5'-X_1YRM_1-3'.

52. A composition, comprising a multimerized complex of

an oligonucleotide comprising:

5'-X_2YRM_2-3'

wherein X_2 is a nucleic acid that consists of a single nucleotide, or a dinucleotide or a trinucleotide that does not comprise a CG dinucleotide, wherein Y is a cytosine or a modified cytosine, wherein R is a guanine or a modified guanine, wherein M_2 is a nucleic acid of 0-27 nucleotides, and

a multimerization unit linked to the 3' end of the oligonucleotide.

53. The composition of claim 52, wherein the multimerization unit is a carrier selected from the group consisting of a microparticle, dendrimer, liposome, cationic complex, cholesterol and antigen.

54. The composition of claim 52, wherein the oligonucleotide is 5'TCG3', 5'TCGT3', 5'UCG3', or 5'UCGT3'.

55. The composition of claim 52, wherein X_2 is a single nucleotide.

56. The composition of claim 52, wherein X_2 is a pyrimidine.

57. The composition of claim 52, wherein the oligonucleotide has phosphodiester internucleotide linkages.

58. The composition of claim 52, wherein M_2 is free of a CG dinucleotide.

59. The composition of claim 52, further comprising administering an antigen to the subject.

60. The composition of claim 52, further comprising administering a therapeutic protocol to the subject.

61. The composition of claim 60, wherein the therapeutic protocol is surgery.

62. The composition of claim 52, wherein the multimerization unit is a linker between the 3' end of the oligonucleotide and a second oligonucleotide.

63. An oligonucleotide comprising:

5'-X_3CGM_3-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein X_3 is a single nucleotide that does not comprise a CG dinucleotide, wherein M_3 is a nucleic acid of 3-27 nucleotides that is free of a CG dinucleotide, and wherein M has at least one of the following properties: is free of a TC dinucleotide, is at least 30% T nucleotides, consists of A, T, and G or is free of a CCTTCC hexamer having at least one modified internucleotide linkage.

64. An oligonucleotide comprising:

5'-X_4CGM_4-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein X_4 is a dinucleotide that does not comprise a CG dinucleotide, wherein M is a nucleic acid of 2-26 nucleotides that is free of a CG dinucleotide, and wherein M_4 has at least one of the following properties: is free of a TG or a GT dinucleotide, is at least 38% T nucleotides or consists of A and T.

65. An oligonucleotide comprising:

5'-X_5CGM_5-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein X_5 is a trinucleotide that does not comprise a CG dinucleotide, wherein M_5 is a nucleic acid of 1-25 nucleotides that is free of a CG dinucleotide, and wherein M_5 has at least one of the following properties: is free of a CT dinucleotide and does not include at least one phosphorothioate linkage, is at least 41% T nucleotides, or consists of A and C.

66. The oligonucleotide of claim 65, wherein the internucleotide linkage between the C and G nucleotides is a phosphodiester linkage.

67. The oligonucleotide of claim 65 wherein the oligonucleotide includes at least two modified internucleotide linkages.

68. An oligonucleotide comprising:

5'-TTGM_6-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein M_6 is a nucleic acid that consists of 5-21 nucleotides, wherein M does not comprise a CG dinucleotide, wherein M_6 is comprised of at least 30% T nucleotides, and wherein said nucleotide is 10-24 nucleotides in length.

69. An oligonucleotide comprising:

5'-X_6CGM_7-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein X_6 is 1-3 nucleotides and does not include a CG dinucleotide, wherein M_7 is a nucleic acid of 6-27 nucleotides and includes at least three CG dinucleotides and is at least 50% T nucleotides.

70. The oligonucleotide of claim 69, wherein M_7 includes at least four CG dinucleotides.

71. The oligonucleotide of claim 69, wherein at least one CG dinucleotide includes a phosphodiester internucleotide linkage.

72. The oligonucleotide of claim 69, wherein at least three CG dinucleotides includes a phosphodiester internucleotide linkage.

73. The oligonucleotide of claim 69, wherein M_7 is 16-18 nucleotides in length.

74. The oligonucleotide of claim 69, wherein the oligonucleotide is selected from the group consisting of SEQ ID NO. 33, 34, 35, 36, and 37.

75. An oligonucleotide comprising:

5'-'TTGM_8-3'

wherein 5' designates the 5' end of the oligonucleotide and 3' designates the 3' end of the oligonucleotide, wherein M_7 is a nucleic acid of 6-18 nucleotides and includes at least one CG dinucleotide and is at least 50% T nucleotides.

76. The oligonucleotide of claim 75, wherein M_8 is 14 nucleotides in length.

77. The oligonucleotide of claim 75, wherein the oligonucleotide is selected from the group consisting of SEQ ID NO. 38, 39, and 40.

78. A method for inducing an immune response, comprising:

administering to a subject an oligonucleotide of any one of claims 63 to 77 or a composition of claim 52 in an effective amount to induce an immune response.

79. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to induce a cytokine selected from the group consisting of Type I and Type II IFN.

80. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to treat the infectious disease.

81. The method of claim 78 wherein the subject has or is at risk of having a bacterial infection.

82. The method of claim 78 wherein the subject has or is at risk of having a viral infection.

83. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to treat cancer.

84. The method of claim 78, wherein the cancer is selected from the group consisting of biliary tract cancer, breast cancer, cervical cancer, choriocarcinoma, colon

cancer, endometrial cancer, gastric cancer, intraepithelial neoplasms, lymphomas, liver cancer, lung cancer (e.g. small cell and non-small cell), melanoma, neuroblastomas, ovarian cancer, pancreatic cancer, prostate cancer, rectal cancer, sarcomas, thyroid cancer, renal cancer, bone cancer, brain and CNS cancer, connective tissue cancer, esophageal cancer, eye cancer, Hodgkin's lymphoma, larynx cancer, oral cavity cancer, skin cancer, and testicular cancer, as well as other carcinomas and sarcomas.

85. The method of claim 78, further comprising administering an anti-cancer agent.

86. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to induce innate immunity.

87. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to induce a Th1 immune response.

88. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount treat allergy.

89. The method of claim 78, wherein the oligonucleotide is administered to the subject in an effective amount to treat asthma.